



December 2015

## Agricultural Research Partnerships (ARP) Network NOTES

Welcome to ARP Network Quarterly Notes! Our goal is to keep you informed about ARP Network and Agricultural Research Service (ARS) current information. We hope that the notes build networking opportunities for businesses to connect with ARP Network Members.

***Please help us spread the word by forwarding and sharing ARP Network Notes statewide with your company contacts, colleagues, other organizations, etc. Thank you!***

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### **ARS**

The Agricultural Research Service is USDA's primary internal research agency. ARS conducts research to develop and transfer solutions to major agricultural problems that are both national and international in

scope. ARS has 2,000 scientists and post docs, as well as, approximately 6,000 other employees to conduct 750 research projects at over 90 locations. ARS has a Congressional mandate to disseminate the research findings of these projects to the American public and other interested parties. Learn more by visiting: <http://www.ars.usda.gov>.

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### **ARP Network**

The ARP Network enlists the help of partners to spark economic development, entrepreneurship and community development. USDA Agricultural Research Service (ARS) founded the ARP Network in an effort to expand the impact of ARS research and provide resources to help companies grow. By combining ARS research expertise with complementary capabilities and talents of partnering organizations, the ARP Network helps stimulate economic growth through technological advancements. The ARP Network matches business needs with ARS innovations and research capabilities and provides business assistant services to help companies and startups solve agricultural problems, develop products and create new jobs. The Network consists of 35 members covering 10 states. Learn more by visiting: <https://www.ars.usda.gov/business/Docs.htm?docid=24715>.

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## ***Save These Dates for Two Exciting ARS Webinars!***

**February 16, at 2:30 p.m. EST**

### **Partnering with U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) to Scale-Up ARS Research into a Commercial Process**

USDA Utilization Centers are available for establishing government - industry partnerships to scale up ARS technologies and to support testing and evaluation programs. Please join us for the webinar to learn about how companies can form technical partnerships with ARS to leverage key strengths and access ARS state-of-the art Utilization Centers.

**March 29, at 2:30 p.m. EST**

### **Partnership Pays: Building a Research Partnership with U.S. Department of Agriculture (USDA) Agricultural Research Service to Enhance Your USDA SBIR Proposal**

Small companies and entrepreneurs can reap many benefits from technology partnerships with ARS laboratories. Through the National Institute for Food and Agriculture (NIFA), the USDA SBIR program provides competitive grants to small businesses to conduct research of innovative concepts in agriculture. Please join us for this innovating webinar to learn about the advantages and nuts and bolts of how to concurrently enter into a collaborate agreement with ARS and apply for a USDA SBIR program award.

***For More Information about Upcoming Webinars, please contact:***

Cathy Cohn at [cathleen.cohn@ars.usda.gov](mailto:cathleen.cohn@ars.usda.gov).

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## Partnership and/or Licensing Opportunity

### **Live, Attenuated *Salmonella enterica* serovar Typhimurium DIVA vaccine**

ARS scientists have developed a mutant *Salmonella enterica* serovar Typhimurium vaccine that can be administered to food-producing animals to decrease *Salmonella* colonization, transmission and clinical disease. The rational design of this vaccine focused on providing protection against multiple *Salmonella* serovars to enhance food safety and improve animal health. Studies in swine have demonstrated protection against virulent, wild-type *Salmonella* Typhimurium challenge, compared to mock-vaccinated pigs, with significantly decreased clinical disease (fever), fecal shedding and gastrointestinal colonization. Vaccinated swine can be differentiated from infected animals 5-weeks following vaccination and booster, and cross-protection against virulent wild-type *Salmonella* Choleraesuis challenge has been demonstrated. Similar results have been demonstrated in turkeys challenged with wild-type *Salmonella* Typhimurium challenge, as well as for those challenged with wild-type, multidrug-resistant *Salmonella* Heidelberg challenge. This technology is available for partnership and/or licensing. International application no. PCT/US2014/072486, ARS Docket no. 68.12.

Please contact Renee Wagner: [renee.wagner@ars.usda.gov](mailto:renee.wagner@ars.usda.gov)

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## Partnership and/or Licensing Opportunity

### **Processes and Treatment Systems for Treating High Phosphorous Containing Fluids**

ARS scientists have developed a process for treating manure slurries to concentrate manure particulate matter into solid form that is easily transportable. The process involves liquid-solid separation and chemical treatment where greater than 90% of the total phosphorous is concentrated into solid form while most of the nitrogen remains in the liquid. The technology could be used to efficiently remove livestock manure phosphorus from areas of excess to areas of shortfall. The system is economical and can be compact and mobile. This technology is available for partnership and/or licensing. ARS Docket no. 45.14. Please contact Jim Poulos: [jim.poulos@ars.usda.gov](mailto:jim.poulos@ars.usda.gov)

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## Partnership Opportunity

### **Digger for Perennial Nutsedge Control**

Yellow and purple nutsedge weeds are common in the southeastern United States, and both perennial species are difficult to control in an organic crop-production system. A mechanical device has been designed for 99+% removal of nutsedge plants from fallow fields. The device is a peanut digger with a specially designed cart attached that collects the nutsedge. Key features includes a custom hitch that allows the correct plane of movement, and a hydraulic conveyor system that discards the perennial nutsedges off-site, away from the field. The concept of using a peanut digger to remove perennial nutsedges from fallow sites appears promising and could open up new geographic areas for successful organic farming. The ARS scientists are seeking a partner to collaborate on modifications and refinements in the operational protocol and research to identify optimum timing, frequency of tillage, and long-term weed control benefits to organic growers. ARS is not seeking patent protection.

Please contact Joe Lipovsky: [joe.lipovsky@ars.usda.gov](mailto:joe.lipovsky@ars.usda.gov) or Tommy Valco: [thomas.valco@ars.usda.gov](mailto:thomas.valco@ars.usda.gov)

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## Partnership Opportunity

### **Assessment Tool for Managing Nitrogen for Field Crops**

Developing assessment tools for managing nitrogen (N) is an important but challenging task, due to the complexities of the soil-crop N cycle and the need to reduce N losses to the environment. The objectives of

this ARS study were to evaluate the effect of fertilizer N rates on post-harvest soil nitrate-N (NO<sub>3</sub>-N), and to evaluate a delta-yield approach for classify post-harvest nitrate in fields, or management zones within fields. Forty N-response studies from Maryland were summarized that measured corn (*Zea mays* L.) grain yields from various fertilizer N rates. Results showed that post-harvest NO<sub>3</sub>-N increased rapidly when yield responses to additional N were small.

This method for classifying residual-nitrate could be used in conjunction with yield monitors to identify areas likely to have high post-harvest residual-nitrate, which could be candidates for winter cover crops or areas needing evaluation of the previous year's N management plan. ARS scientist is looking for an AG IT company as a Cooperative Research and Development Agreement (CRADA) partner to assist with software development. ARS is not seeking patent protection. ARS docket no. 128.14.

Please contact Jim Poulos: [jim.poulos@ars.usda.gov](mailto:jim.poulos@ars.usda.gov)

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### Partnership Opportunity

#### **New Natural Compositions as Wood Adhesives**

Conventional wood adhesives often incorporate formaldehyde resins. However, because of concerns regarding formaldehyde emissions, environmentally friendly wood adhesives based on natural renewables are gaining attention. In order to advance the use of natural products as adhesives, improved adhesive strength, water resistance and reduced cost are desirable. ARS scientists are working on a blend of natural compounds that exhibit superior performance at a reduced cost relative to some other natural adhesives. The scientists involved in this work are interested in a commercial partner with which to further test and develop this technology. ARS docket no. 14.16.

Please contact Joe Lipovsky: [joe.lipovsky@ars.usda.gov](mailto:joe.lipovsky@ars.usda.gov) or Tommy Valco: [thomas.valco@ars.usda.gov](mailto:thomas.valco@ars.usda.gov)

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### Partnership Opportunity

#### **Software to Integrate Digital Image Analysis of Phenotype Data in Animals**

This technology relates to software to measure, predict and collect external characteristics (phenotype) of the object of interest, using 2D digital images obtainable from cell phone or dedicated digital cameras; and provides a method to collect and collate associated demographic and biometric data. Prior art is more expensive and cumbersome, for example, stereo vision, by placing two cameras at specified distances from each other and the subject, and using triangulation to calculate measurements. Tomography or 3D imaging has also been employed, but again are complex and require specialized equipment. Farmers, veterinarians, researchers or consumers will be able to biometrically verify individual identity and lineage. Similarly, body weight will be predicted from images, enabling the setting of market value, monitoring growth, or setting proper dosage for medications or anthelmintics. The method of this invention improves the accuracy of image segmentation by 19.5 %. This technology will find use in Agriculture as Farmers, veterinarians, researchers will be able to biometrically verify individual identity and lineage of production animals. ARS docket no. 9.16. ARS is not seeking patent protection.

Please contact Jim Poulos: [jim.poulos@ars.usda.gov](mailto:jim.poulos@ars.usda.gov)

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### Partnership and/or Licensing Opportunity

#### **Mitochondrial DNA as a Molecular Indicator of Thermal Food Processing Efficacy and Inactivation of Biological Material**

Currently, in the food industry there are molecular methods using quantitative polymerase chain reaction (qPCR) to enhance food safety and verify labeling. Instead of using qPCR to detect pathogens, identify

adulterants or authenticate ingredients, ARS scientists in collaboration with North Carolina State, have developed a technology to quantify the fragmentation of intrinsic food's mitochondrial DNA (mtDNA) as a time-temperature integrator (TTI). Food material contains abundant copies of conserved mtDNA that degrades gradually during microwave or thermal treatment. The amount of remaining mtDNA can be correlated with the viability of bacterial pathogens in the processed foods. This test can be completed in 4-6 hours using a conventional PCR or qPCR molecular test. This technology can be used to test food processed by pasteurization, conventional heating, retorting, industrial microwaving, and roasting for human consumption and/or animal feed. In addition to food substances, many other items could be tested that need to be rendered sterile or have a reduction in the viability of biological material on the items prior to use such as reusable medical and dental devices. This technology is available for partnership and/or licensing. International Application No.: PCT/US14/54749. ARS Docket no. 42.13 and 64.14. Please contact Joe Lipovsky: [joe.lipovsky@ars.usda.gov](mailto:joe.lipovsky@ars.usda.gov) or Tommy Valco: [thomas.valco@ars.usda.gov](mailto:thomas.valco@ars.usda.gov)

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### **Partnership and/or Licensing Opportunity**

#### **Genes for Enhancing Sorgoleone Production in Plants**

Sorghum plants produce within its root hair cells a compound called sorgoleone that is thought to act as a natural herbicide. Hence, Sorgoleone could perhaps be used in other species of desirable plants. Current evidence indicates that the production of sorgoleone likely accounts for much of the inherent weed-fighting properties associated with members of the genus Sorghum. Since sorgoleone acts as a potent broad-spectrum inhibitor active against many important weed species, exhibits a long half-life in soil and appears to affect multiple targets in vivo, it is particularly promising for development as a natural product alternative to synthetic herbicides.

ARS scientists have identified and characterized genes responsible for the production of sorgoleone (fatty acid desaturases, O-methyltransferase, alkylresorcinol synthases, and pentadecatrienyl resorcinol hydroxylases). Also, the ability to transfer this to other plants has been demonstrated.

It is envisioned that crop plants producing sorgoleone in sufficient quantities would require fewer herbicide applications to obtain effective weed control under field conditions. Such crops could also potentially exhibit enhanced disease resistance, as sorgoleone and other alkylresorcinol derivatives are known to possess significant antimicrobial activity.

The ARS scientists are seeking partners to further develop this technology for use in crops. US patents 7,732,666 and 8,383,890 and allowed applications US 20110225676 and US 20140308731. ARS Dockets: 20.04, 109.06, 145.06 and 145.12.

Please contact Joe Lipovsky: [joe.lipovsky@ars.usda.gov](mailto:joe.lipovsky@ars.usda.gov) or Tommy Valco: [thomas.valco@ars.usda.gov](mailto:thomas.valco@ars.usda.gov)

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## Partnership Opportunity

### Combinatorial Enzyme Technology

ARS has been developing "Combinatorial Enzyme Technology" for the conversion of agricultural waste fibers to designer oligosaccharides with commercially viable food and non-food applications. The emerging "green" industry, with its increasing demand for new products that are environmentally friendly, will be particularly benefited by this technology for developing bio-based replacements for products normally derived from petroleum or synthetic chemicals. The use of non-digestive oligosaccharides has gained acceptance rapidly as functional foods (nutraceuticals and prebiotics), with the global market reaching 90 billion dollars yearly. There is also huge potential for pharmaceutical, cosmetic, and other non-food applications that have not received as much attention for commercial exploration. Specialty oligosaccharides show particular promise because of their unique properties: i.e. gel forming, antimicrobial effect, cosmetic anti-skin ageing, drug carrier, anti-inflammatory, inhibition of free-radical damage, and inhibition of glycation. Oligosaccharides can undergo further enzymatic modifications to produce excellent surfactants, biodegradable plastics, films, coatings, capsules and tablets. Starting materials for these oligosaccharides include biomass feedstock and agricultural waste fibers. There appears to be particular opportunity in exploiting the waste material generated from food and industrial processing, such as citrus peel, apple pomace, almond husk, sugar-beet pulp, rice husk, wheat straw, corn stover, oleaginous seed residues, algal processing waste, and many others. The Combinatorial Enzyme Technology is not limited by applications in the conversion of polysaccharides to novel oligosaccharides. This Technology should apply equally well to exploring new product functions in all types of biopolymers and heteropolymers. The ARS is looking for an industrial partner to further develop and commercialize the technology.

Please contact David Nicholson: [david.nicholson@ars.usda.gov](mailto:david.nicholson@ars.usda.gov)

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### New Available Technologies for Licensing

Each year, approximately 60 new patents are issued by the U.S. Patent Office for USDA inventions. The Office of Technology Transfer (OTT) transfers these inventions through licenses to the private sector for commercialization. Here is a link to *recently filed* U.S. patent applications that are available for licensing. This list is updated monthly so check back often!

<http://www.ars.usda.gov/business/Docs.htm?docid=25285>

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### Recently Issued ARS Patents

View a list of 2015 issued U.S. patents: <http://www.ars.usda.gov/business/Docs.htm?docid=25285>

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### ARS Digital Online Research Magazine

*AgResearch* is a monthly publication highlighting short features on the scientific research discoveries occurring at all of ARS' research laboratories across the Nation and abroad. View *AgResearch* at <http://agresearchmag.ars.usda.gov>. One can subscribe to electronic delivery of the magazine on the website.



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## USDA Blog

Check out the USDA Blog site for updates on Agricultural issues: <http://blogs.usda.gov>. One can sign up for email updates on the website by checking boxes of categories of interest including the blog, news categories and social media.

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## Welcome to VIVO

USDA VIVO provides a powerful Web search tool for connecting researchers, research projects and outcomes and others with relationships to the research. The idea is to link researchers with peers and potential collaborators. VIVO makes it possible to quickly identify USDA scientific expertise:

<http://vivo.usda.gov>.

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*We are seeking contributions for future ARP Network Notes from members who wish to share information that would be of interest to the group. Suggestions include events, Ag challenges and community initiatives. For ideas of content for future notes, please contact Cathy Cohn at [cathleen.cohn@ars.usda.gov](mailto:cathleen.cohn@ars.usda.gov).*

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**Get more information:** [www.ars.usda.gov](http://www.ars.usda.gov)



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